OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **COLE POND** the program coordinators recommend the following actions. *We would like to encourage the association to conduct more sampling events in the future. With a limited amount of data it is difficult to determine water quality trends. Since weather patterns and activity in the watershed can change throughout the summer it is a good idea to sample the pond several times over the course of the season.*

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *stable* in-lake chlorophyll-a trend. The chlorophyll-a concentration has remained well below the state mean in the pond for nearly ten years. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *slightly improving* trend in lake transparency. The Secchi disk was visible at the bottom of the pond, and the transparency results remain above the average for New Hampshire lakes. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is

the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *fairly stable* trend for in-lake phosphorus levels. The phosphorus concentration in the hypolimnion was back to a low level for the pond this season. Both layers had means below the state median. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- The conductivity in the Cole Pond watershed remains very low (Table 6). Conductivity increases often indicate the influence of human activities on surface waters. Septic system leachate, agricultural runoff, iron deposits, and road runoff can each influence conductivity readings. The low values at Cole Pond indicate these human activities are not of great concern to the quality of water in the watershed.

- **Please note** this summer the epilimnetic phosphorus concentrations, and also those in the 2nd Inlet, Dam Outlet, and Main Inlet, were found to be less than 5 µg/L. The NHDES Laboratory Services adopted a new limit for reporting total phosphorus this year and the lowest value recorded is 'less than 5 µg/L'. We would like to remind the association that a reading of 5 µg/L is considered low for New Hampshire's waters.

- Dissolved oxygen was again high at all depths of the pond (Table 9). This may be due to the shallowness of the pond, but still bodes well for the plant and animal species in the pond.

- Please remember the Colby-Sawyer College Laboratory in New London, in cooperation with the Lake Sunapee Protective Association, is available to analyze water samples for the VLAP lakes in the area. The lab manager, Bonnie Lewis, is available throughout the summer to distribute sample bottles. If the association would like to take on more sampling events in the future, contact Bonnie at (603) 526-3486 to schedule a time for bottle pick-up.

NOTES

- Monitor's Note (7/24/00): Salamanders have been seen with deformities; very abundant salamanders. Logging in watershed and new roads built causing a large amount of silt to be deposited in wetland. Trout-stocked pond.

USEFUL RESOURCES

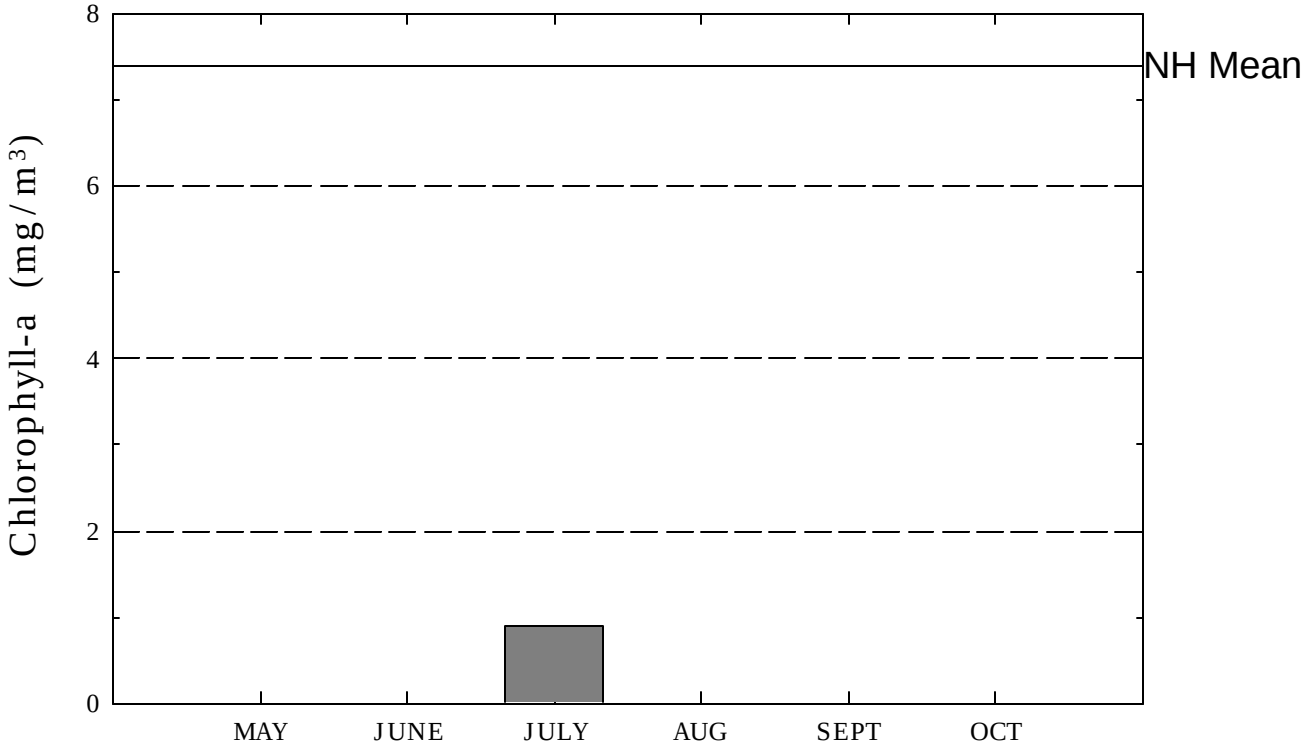
Wetlands: More Important Than You Think, NHDES Booklet, (603) 271-3503 or www.state.nh.us

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

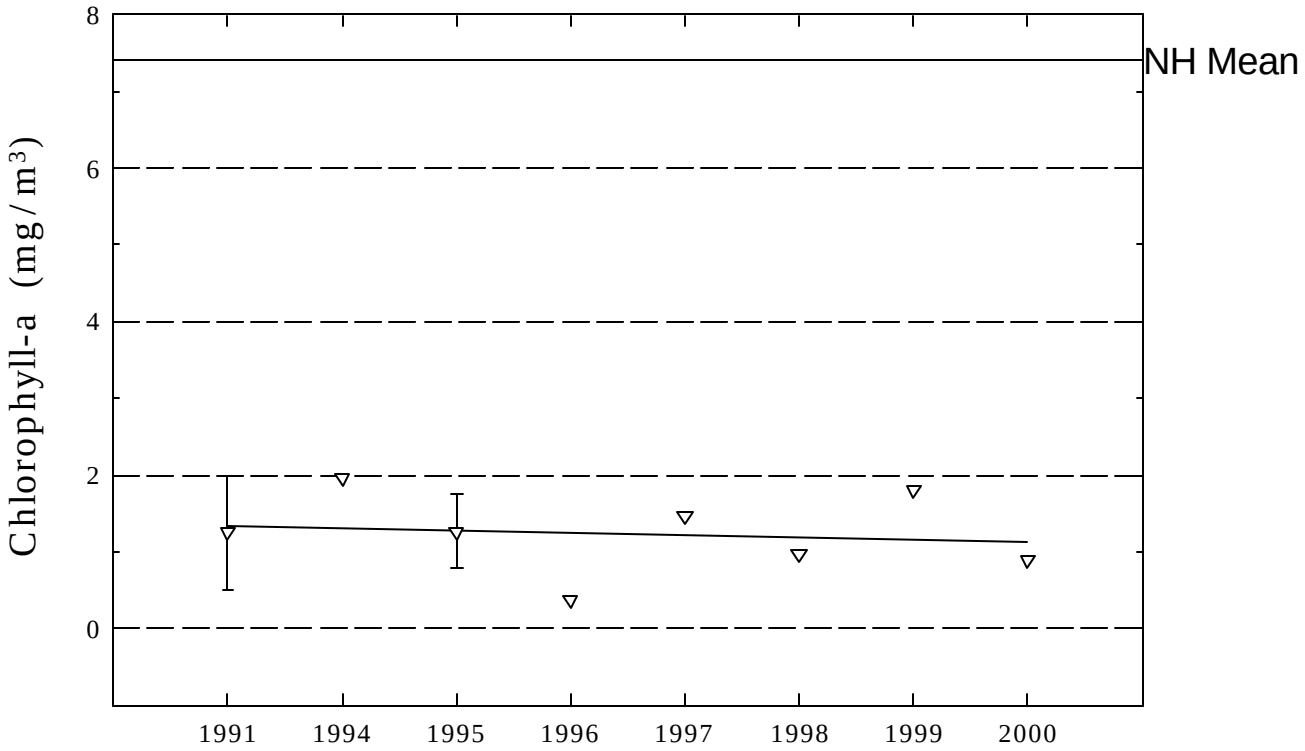
Through the Looking Glass: A Field Guide to Aquatic Plants. North American Lake Management Society, 1988. (608) 233-2836 or www.nalms.org

Cole Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



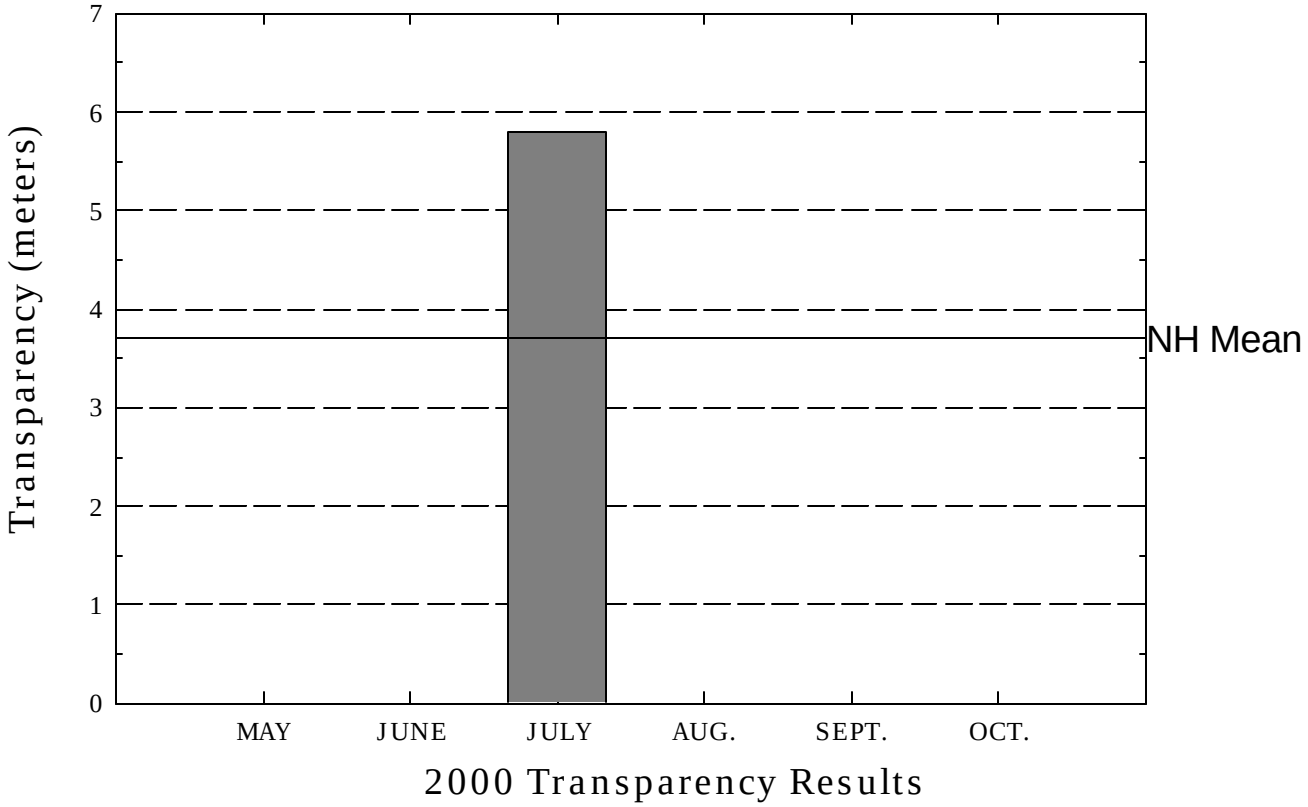
2000 Chlorophyll-a Results

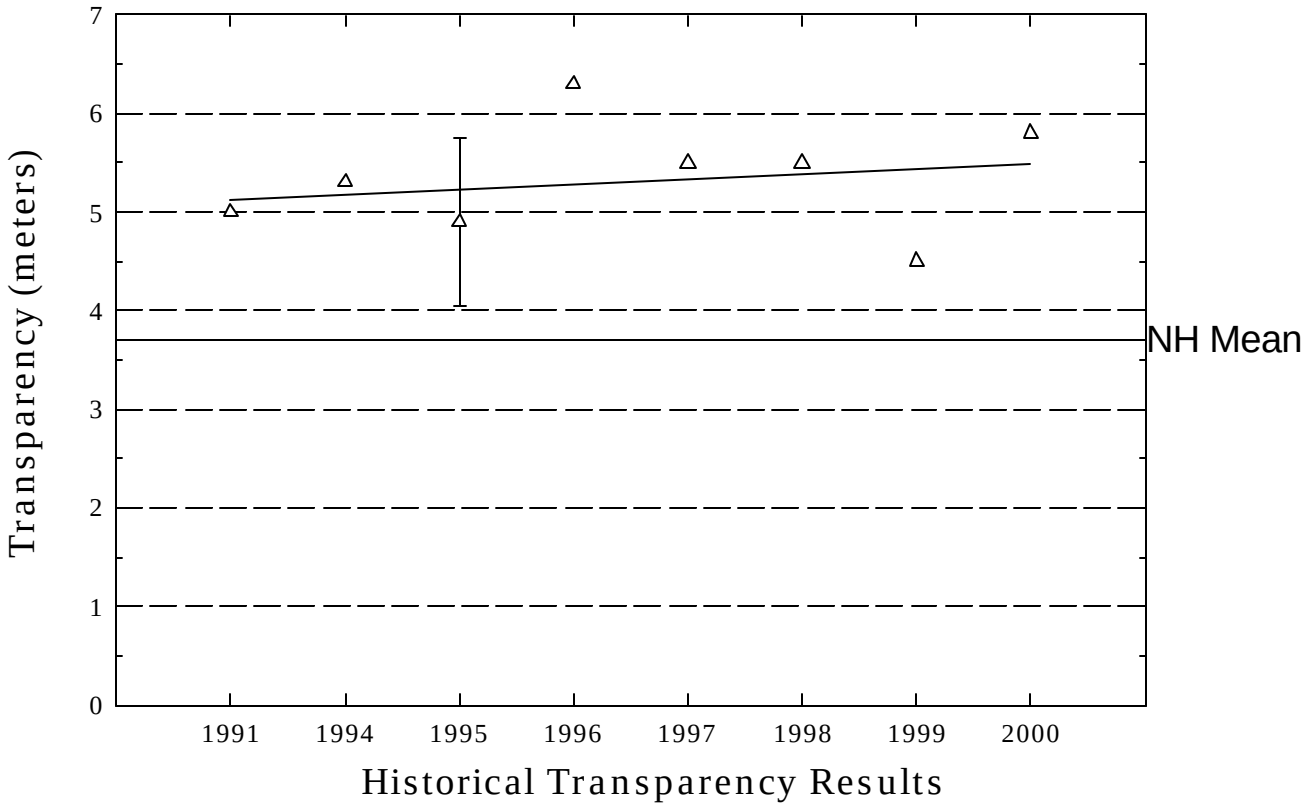


Historical Chlorophyll-a Results

Cole Pond

Figure 2. Monthly and Historical Transparency Results





Cole Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

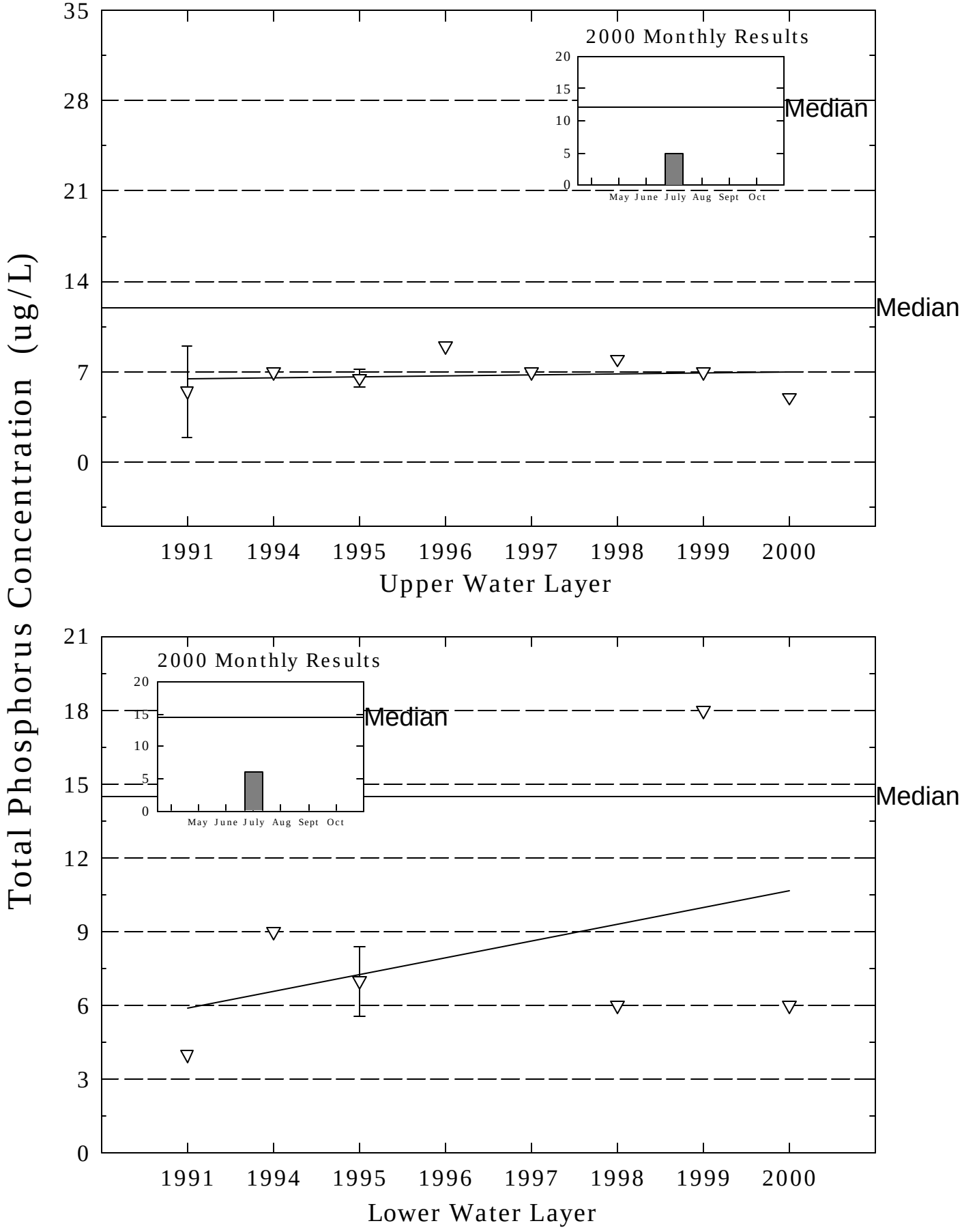


Table 1.

COLE POND
ANDOVER

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1991	0.73	1.78	1.39
1994	1.97	1.97	1.97
1995	0.92	1.61	1.26
1996	0.38	0.38	0.38
1997	1.47	1.47	1.47
1998	0.97	0.97	0.97
1999	1.80	1.80	1.80
2000	0.90	0.90	0.90

Table 2.

COLE POND

ANDOVER

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07/03/1991	SPHAEROCYSTIS	27
	GLOEOCYSTIS	24
	XANTHIDIUM	22
08/03/1994	MERISMOPEDIA	93
08/10/1995	GLOEOCYSTIS	29
	ASTERIONELLA	22
	SPHAEROCYSTIS	16
07/23/1996	TABELLARIA	6
	ASTERIONELLA	4
	DINOBRYON	4
07/14/1997	SPHAEROCYSTIS	53
	UROGLENOPSIS	33
	MELOSIRA	8
08/11/1998	GYMNODINIUM	33
	DINOBRYON	28
	CERATIUM AND CLOSTERIUM	11
08/11/1998	GYMNODINIUM	33
	DINOBRYON	28
	CERATIUM	11
07/16/1999	MERISMOPEDIA	61
	MALLOMONAS	14
	GLOEOCYSTIS	7
07/24/2000	MOUGEOTIA	96
	MICROCYSTIS	2
	XANTHIDIUM	1

Table 3.

COLE POND

ANDOVER

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1991	5.0	5.0	5.0
1994	5.3	5.3	5.3
1995	4.3	5.5	4.9
1996	6.3	6.3	6.3
1997	5.5	5.5	5.5
1998	5.5	5.5	5.5
1999	4.5	4.5	4.5
2000	5.8	5.8	5.8

Table 4.

COLE POND
ANDOVER

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
2ND INLET				
	1997	5.23	5.23	5.23
	1998	5.70	5.70	5.70
	2000	6.05	6.05	6.05
DAM OUTLET				
	1994	6.37	6.37	6.37
	1995	6.44	6.49	6.46
	1996	5.66	5.66	5.66
	1997	6.01	6.01	6.01
	1998	6.34	6.34	6.34
	1999	6.34	6.34	6.34
	2000	6.25	6.25	6.25
EPILIMNION				
	1991	5.41	6.37	5.78
	1994	6.33	6.33	6.33
	1995	6.39	6.43	6.41
	1996	5.63	5.63	5.63
	1997	5.90	5.90	5.90
	1998	6.21	6.21	6.21
	1999	6.57	6.57	6.57
	2000	6.30	6.30	6.30
FRANKLIN INLET				
	1991	6.16	6.16	6.16

Table 4.

COLE POND
ANDOVER

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
HYPOLIMNION				
	1991	5.98	6.22	6.08
	1994	6.19	6.19	6.19
	1995	6.16	6.28	6.22
	1998	6.07	6.07	6.07
	1999	6.22	6.22	6.22
	2000	6.07	6.07	6.07
MAIN INLET				
	1994	6.49	6.49	6.49
	1995	6.00	6.31	6.13
	1996	5.59	5.59	5.59
	1997	5.98	5.98	5.98
	1998	6.66	6.66	6.66
	2000	6.46	6.46	6.46
NORTHEAST INLET				
	1999	6.02	6.02	6.02
OUTLET				
	1991	6.20	6.20	6.20

Table 5.

COLE POND

ANDOVER

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1991	2.40	3.10	2.75
1994	2.10	2.10	2.10
1995	2.50	2.80	2.65
1996	1.40	1.40	1.40
1997	0.00	0.00	0.00
1998	2.10	2.10	2.10
1999	2.10	2.10	2.10
2000	1.50	1.50	1.50

Table 6.

COLE POND
ANDOVER

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
2ND INLET				
	1997	19.0	19.0	19.0
	1998	17.7	17.7	17.7
	2000	18.6	18.6	18.6
DAM OUTLET				
	1994	20.1	20.1	20.1
	1995	20.2	21.0	20.6
	1996	18.7	18.7	18.7
	1997	22.7	22.7	22.7
	1998	16.2	16.2	16.2
	1999	18.6	18.6	18.6
	2000	17.4	17.4	17.4
EPILIMNION				
	1991	18.3	20.1	19.2
	1994	20.3	20.3	20.3
	1995	20.0	20.3	20.1
	1996	19.1	19.1	19.1
	1997	16.9	16.9	16.9
	1998	16.4	16.4	16.4
	1999	18.5	18.5	18.5
	2000	17.4	17.4	17.4
FRANKLIN INLET				
	1991	118.9	118.9	118.9
HYPOLIMNION				
	1991	19.6	19.8	19.7
	1994	20.3	20.3	20.3

Table 6.

COLE POND
ANDOVER

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1995	20.3	20.4	20.3
	1998	16.7	16.7	16.7
	1999	18.3	18.3	18.3
	2000	17.5	17.5	17.5
MAIN INLET				
	1994	20.4	20.4	20.4
	1995	21.9	26.1	24.0
	1996	20.3	20.3	20.3
	1997	19.1	19.1	19.1
	1998	16.4	16.4	16.4
	2000	18.4	18.4	18.4
NORTHEAST INLET				
	1999	25.0	25.0	25.0
OUTLET				
	1991	40.4	40.4	40.4

Table 8.

COLE POND

ANDOVER

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
2ND INLET				
	1997	< 1	1	1
	1998	3	3	3
	2000	< 5	5	5
DAM OUTLET				
	1994	8	8	8
	1995	7	10	8
	1996	7	7	7
	1997	4	4	4
	1998	7	7	7
	1999	7	7	7
	2000	< 5	5	5
EPILIMNION				
	1991	1	8	4
	1994	7	7	7
	1995	6	7	6
	1996	9	9	9
	1997	7	7	7
	1998	8	8	8
	1999	7	7	7
	2000	< 5	5	5
FRANKLIN INLET				
	1991	16	16	16
HYPOLIMNION				
	1991	1	4	2
	1994	9	9	9

Table 8.

COLE POND

ANDOVER

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1995	6	8	7
	1998	6	6	6
	1999	18	18	18
	2000	6	6	6
MAIN INLET				
	1994	3	3	3
	1995	6	11	8
	1996	9	9	9
	1997	6	6	6
	1998	10	10	10
	2000	< 5	5	5
NORTHEAST INLET				
	1999	6	6	6
OUTLET				
	1991	9	9	9

Table 9.

COLE POND

ANDOVER

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		July 24, 2000	
0.1	21.9	6.8	78.2
1.0	21.6	6.8	76.8
2.0	21.5	6.7	76.1
3.0	21.5	6.6	74.3
4.0	21.5	6.6	74.9
5.0	21.4	6.5	73.1

Table 10.

COLE POND

ANDOVER

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
March 28, 1991	3.5	2.6	12.9	91.0
July 3, 1991	4.5	22.0	7.5	86.3
August 3, 1994	5.5	23.0	4.6	53.0
August 10, 1995	4.5	23.0	7.4	86.0
July 23, 1996	6.0	19.0	6.5	69.0
July 14, 1997	5.0	23.0	6.3	73.0
August 11, 1998	5.0	24.4	7.1	84.0
July 16, 1999	5.0	23.2	5.6	65.6

Table 11.

COLE POND
ANDOVER

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
2ND INLET				
	1997	0.0	0.0	0.0
	1998	0.1	0.1	0.1
	2000	0.0	0.0	0.0
DAM OUTLET				
	1997	0.1	0.1	0.1
	1998	0.2	0.2	0.2
	1999	0.4	0.4	0.4
	2000	0.1	0.1	0.1
EPILIMNION				
	1997	0.2	0.2	0.2
	1998	0.2	0.2	0.2
	1999	0.3	0.3	0.3
	2000	0.2	0.2	0.2
HYPOLIMNION				
	1998	0.3	0.3	0.3
	1999	2.7	2.7	2.7
	2000	0.2	0.2	0.2
MAIN INLET				
	1997	0.1	0.1	0.1
	1998	0.5	0.5	0.5
	2000	0.5	0.5	0.5
NORTHEAST INLET				
	1999	2.0	2.0	2.0